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DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH

Bureau of Water Pollution Control
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October 28, 1988

Mr. Allen S. Gordon
Western States Mineral Corporation
4975 Van Gordon Street
Wheatridge, Colorado 80033

Re: *Tug Mine*
Plans and Specifications Review

Dear Mr. Gordon:

We have reviewed the 19 August 1988 response letter, plans and specifications concerning the Tug Mine project. Our comments correspond to the order of response in your letter, and are as follows:

1 *Item 2*

Documents and relevant information concerning wells and water analysis in the area of the proposed project must be submitted for our review and approval.

2. *Item 5*

The design information requested for the leak detection system, i.e. permeability rate, thickness of the leak detection media and the base, has not been received. This information is essential to continue our review for approval of the project.

3. *Item 6*

Leak detection media must be at least three (3) orders of magnitude more permeable than the leak detection base material. In addition, once the leach pads have been excavated to grade, verification that the natural material is at least six (6) inches thick, has a permeability of 1×10^{-6} centimeters per second or less, and is free from pockets of sand or gravel, must be provided. Following verification, the base material must be scarified and compacted.

Additional specifications must be included stating that compaction of the secondary clay liner must be conducted at or above optimum moisture content. Also, it must be specified that at least 95 per cent of standard proctor be achieved for the secondary clay liner. The result of these specifications and others which may be included for the secondary clay liner must result in a maximum permeability rate of 1×10^{-7} centimeters per second.

The quality of field seaming for the flexible membrane liner must be verified by adequate number of destructive and non-destructive tests results for a specified length of field seam.

The quality of construction of the secondary clay liner must be verified for moisture content during compaction, density, thickness, gradation and permeability. The following is a suggested acceptable schedule for quality control:

a. Moisture and density tests every 100 cubic yards (approximately 50 foot grid) over the entire surface of each lift of the secondary clay liner.

b. Thickness verification every 100 cubic yards (approximately 50 foot grid) over the entire surface of each lift of the secondary clay liner.

c. Gradation tests every 500 cubic yards (approximately 115 foot grid) during initial start-up and every 1500 cubic yards throughout the remainder of the project for each lift.

d. Triaxial permeability tests every 500 cubic yards for the first 2000 cubic yards. An additional triaxial permeability test must be conducted for each 8500 cubic yards or part thereof of secondary clay liner placed thereafter, for each lift placed.

Following completion of the construction,the inspector must certify in *writing* that: (1) the flexible membrane, the secondary clay liner and the base were constructed according to approved plans and specifications, and (2) that results of all quality control tests meet or exceed minimum requirements.

4. *Item 7*

The maximum permeability of the secondary clay liner material must be 1×10^{-7} centimeters per second or less. The construction specifications to achieve this value must be defined and the fine grain material must be compacted at or above optimum moisture content.

5. *Item 9*

Item 36 comment covers this issue.

6. *Item 10*

We understand that the minus 1/2 inch size ore material will be end dumped on the flexible membrane in a minimum five (5) foot lift.

7. *Item 12*

Details of the process solution collection system design such as permeability of the ore material, pipe spacing, pipe size etc. still have not been received.

8. *Item 16*

The transmissivity (minimum lateral permeability in the material) of the geodrain under the design loading conditions must be provided for review.

9. *Item 17*

This issue is covered in our comment to Item 6 response.

10. *Item 19*

Information concerning approvable details of the liner for the process area which will insure that spills are adequately contained must be submitted for review before a construction permit can be issued.

11. *Item 20*

The information presented on Page 24 of the specifications concerning leakage must be modified as follows:

a. The Bureau of Water Pollution Control must be notified at each level when liquids are found in the leak detection system.

Notification must be by phone within 24 hours, and in writing within seven (7) days.

b. *At any level, when it is verified that the liquids in the leak detection system are process fluids, the facility (pad or pond) must discontinue operations.* The facility will only be allowed to resume operations after repairs or other remedial action such that process fluids will no longer flow through the liner system.

c. The leakage rates specified are actually gallons per acre-day and the specifications should be modified accordingly.

12. *Item 21*

The spent heap must be neutralized in accordance with the following criteria, or criteria in effect at the time of decommissioning:

a. pH of 6.5 to 8.0

b. Weak acid dissociable (WAD) cyanides less than or equal to 0.20 mg/l.

c. Total cyanide less than or equal to 0.75 mg/l.

d. Metals content shall meet drinking water standards.

13. *Item 22*

The neutralization criteria for the spent heaps as stated on Page 24 of the specifications is acceptable. This information must be included in the closure document which must be approved prior to the issuance of a construction permit.

The closure document must include that the neutralization parameters be verified in three (3) tests reasonably spaced during a twenty-four (24) hour period. The spent ore pile must remain undisturbed for at least six (6) years following neutralization in accordance with the above criteria and completion of other appropriate reclamation measures. This will allow natural decomposition of any localized pockets of cyanide further.

14. *Item 28*

Specification reference 5.5 should clarify its applicability to sand in the leak detection sump or sand in the leak detection media. Specification on sand in leak detection media must be provided, if not covered by reference 5.5.

15. *Item 29*

The specification reference 6.3 on the HDPE flexible membrane liner, must specify compliance with the minimum requirements of the National Sanitation Foundation (NSF) Standard No. 54.

16. *Item 32*

The specifications (ref. Page 16) and the technical specifications on construction (ref. Page 21) must be reviewed to eliminate apparently contradictory requirements. On Page 16 of the specifications, it is stated that the potential borrow source for clay can achieve a permeability rate of 5×10^{-8} centimeters per second when compacted to 95 percent of maximum dry density at optimum moisture content; while Page 21 states requirements on permeability at only 1×10^{-6} centimeters per second, unspecified moisture content, and 85 percent compaction. An acceptable secondary clay liner must meet the gradation requirements, compaction of 95 percent of standard proctor at or above optimum moisture content, and permeability rate of 1×10^{-7} or less.

Specifications must address this issue before issuance of a construction permit.

17. *Item 34*

a. Geotextile may be used for the pad leak detection system on the sloping parts of the pad; but must not be used on the parts of the pad where ore will be placed. This is due to compressible nature of geotextiles.

Also, details on how leakage from any part of the pad will reach the sump in a timely manner, the pad leak detection sump, and monitoring must be provided for review.

b. Details of the liner for the process area, and those of the security fencing for the project must be submitted for review and approval.

c. Sediment control using hay bales is not acceptable considering nature of the material used and the life of the project. This issue must be reviewed further with us and the Division of Oil, Gas and Mining.

18. *Item 36*

We have still not received detailed information and specifications for the F-mat flexible membrane liner material. This information must be submitted for review and approval.

a. The process pond floor must slope towards the sump to prevent any ponding of leakage in the geodrain. Detail No. 2 (Drawing No. 4406/04) shows 0.5 percent slope for the process pond sump. This detail has not been referred to anywhere else on the plans for the floor of the process ponds.

b. This issue has been addressed in our Comment No. 17.

c. The specific requirements of the quality assurance procedures for seaming the PVC to F-mat liner must be submitted for review. Also, it must be specified whether the seam will be a factory or field seam.

d. High density polyethylene (HDPE) may be used for the top pond liner. The minimum thickness must be sixty (60) mils to achieve a good field seam based on the information from summaries of field experience .

e. Details of the proposal to protect the chemical storage area liner from chemical storage container damage must be provided for review and approval.

19. *Item 37*

The process pond capacity must be designed to accommodate volume of a total drain down in the event of winter shutdown.

The information in your latest submittal dated August 19, 1988, does not contain the information regarding wells, geophysical logs of wells, well logs showing the nature, depth and base of the alluvial fill, water level, water quality, etc., requested earlier. Logs submitted do not show penetration of bedrock. This information must be received for review and approval.

In addition, we would like to review the analysis and tests that show the waste rock (as described on Page 10 of the latest submittal) will not produce a leachate which may potentially degrade ground or surface water quality.

Please call Charlie Dietz or Mack Croft if there are any questions.

Sincerely,

Michael K Reichert

for Don A. Ostler, P.E., Director
Bureau of Water Pollution Control

CGD:jgh/ag

cc: Mr. Don Poulter, Steffen Robertson Kirsten
Mr. Joel Hoyt, Bear River District Health Dept.
Mr. Lowell Braxton, Division of Oil, Gas & Mining

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